



(RESEARCH ARTICLE)



The effectiveness of the Paris agreement: Successes, challenges and future directions

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Abstract

The Paris Agreement from 2015 serves as a major international response to climate change through temperature limitations below 2°C and a goal of reaching 1.5°C. The effectiveness of this agreement is examined through an analysis that includes its achievements, present obstacles, and prospects. The Paris Agreement achieved three major results through its wide international cooperation, including increased renewable energy investments and enhanced climate funding systems. The Paris Agreement encountered major obstacles because it lacked sufficient national pledges, weak enforcement tools, limited funds, and opposition from political groups. This research indicates that national commitments through NDCs do not reach the necessary levels to achieve international climate goals. This research presents policy recommendations that seek to improve implementation while offering financial backing and technological resources and establishing better international partnerships. The long-term success of the Paris Agreement relies on improved country-level commitments, tighter accountability systems, and continuous international cooperation.

Keywords: Paris Agreement; Climate Change; Global Governance; Emissions Reduction; Nationally Determined Contributions (NDCs); Renewable Energy; Climate Finance; Compliance Mechanisms; Climate Policy; International Cooperation

1. Introduction

1.1. Background of the Paris Agreement

Climate change currently represents a vital global challenge during the twenty-first century, affecting environmental systems, economic frameworks, and social structures worldwide (Adger et al. 2005; Leal Filho et al. 2021; Feliciano et al. 2022). International cooperation becomes essential since we face critical global warming effects, abnormal weather patterns, rising sea levels, and biodiversity reduction (Battisti and Naylor 2009; Schuurmans 2021). The Paris Agreement emerged in December 2015 through the 21st Conference of the Parties (COP21) under the United Nations Framework Convention on Climate Change (UNFCCC) (United Nations). The legally enforceable Paris Agreement works to restrict temperature elevation to less than 2 degrees Celsius above pre-industrial times while pushing for a challenging limit of 1.5 degrees Celsius.

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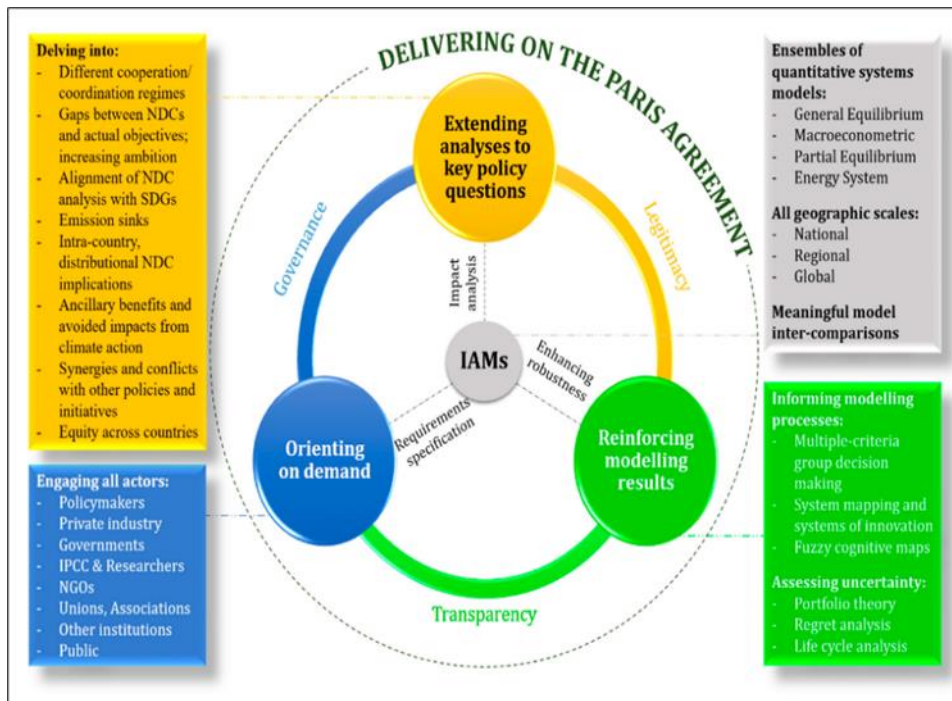


Figure 1 An integrative climate policy support framework for delivering on the Paris Agreement

The Paris Agreement represents a different approach from the Kyoto Protocol by creating an adaptable and broad-based framework. All member nations need to develop and present nationally determined contributions where they explain their climate action plans and emission reduction targets along with their adaptation strategies. Through its structure, the agreement establishes accountability measures. It ensures climate action transparency while providing financial support and technological transfers to developing nations to build a just and equitable low-carbon economy (UNFCCC).

The Paris Agreement faces ongoing criticism of its impact even though most nations have adopted it and set ambitious targets. Many nations perform satisfactorily in keeping their climate promises, yet worldwide greenhouse gas (GHG) emissions continue to increase. Scientific evaluations demonstrate that NDCs fail to satisfy the crucial temperature limit of 1.5 degrees Celsius (UNFCCC). The absence of binding enforcement procedures within the agreement creates substantial uncertainties about state compliance and accountability, thus limiting the ability to monitor commitment compliance. Various economic factors and political and technological constraints prevent developing nations from achieving climate policy goals because they lack sufficient resources and basic infrastructure (Denchak, 2025).

The study examines how effective the Paris Agreement is by investigating its accomplishments alongside the obstacles it encountered and possible future paths. A comprehensive analysis of these elements will help advance global climate governance by ensuring the effective execution of intended objectives.

1.2. Research Objectives

The main goal of this investigation is to extensively examine the Paris Agreement because of its complex role in worldwide climate management. The research establishes an evaluation basis by studying four essential aspects of the Paris Agreement, which include how well nations participate and their emission reduction efforts alongside initiatives for climate funding and policy framework development. The assessment of successful Agreement elements needs to proceed because it helps determine effective Agreement components while identifying direct climate change mitigation results.

This study analyzes the obstacles that prevent the agreement from reaching its effectiveness goals. The examination analyzes agreements that face problems because of inadequate state pledges, weak follow-up systems, ancient funding, and political opposition to climate change initiatives. The research aims to identify important problem areas by examining barriers that affect Paris Agreement performance so these areas can receive necessary attention and reform.

The research concludes by examining future paths and establishing policy suggestions to boost the agreement's effectiveness. The study proposes methods to enhance Nationally Determined Contributions (NDCs) and improve compliance systems with strategies for strengthening international cooperation. The study presents practical solutions to help the ongoing climate policy dialogue and define steps to implement the Paris Agreement better.

1.3. Research Questions

The research seeks to answer fundamental questions that reveal the effectiveness of the Paris Agreement. The first research inquiry explores how well the agreement meets its established climate objectives. The evaluation of this treaty's overall effect determines its advancement in global temperature restraint efforts.

The investigation analyzes the main accomplishments that have materialized because of the agreement's implementation. The study focuses on presenting successful outcomes through international climate action collaboration because it demonstrates the benefits of global climate commitments.

The third study area investigates obstacles that stop the agreement from working optimally. Identifying these obstacles becomes essential for creating solutions because they block the deal from achieving its targets.

The study addresses what policy recommendations should be implemented to improve both the implementation process and the total effectiveness of the Paris Agreement. The research question focuses on discovering meaningful advice to enhance climate legislation and strengthen worldwide climate change response. These research questions establish a complete evaluation system for understanding how the Paris Agreement handles our generation's foremost planetary crisis.

1.4. Significance of the Study

The findings of this research benefit multiple stakeholder groups, including policymakers, climate negotiators, scholars, and advocates who work in global climate governance. The analysis evaluates the Paris Agreement's effectiveness to shed light on its performance and highlight essential areas that need improvement. The research outcomes direct upcoming climate policy development while supporting international partnerships and advancing the discussion on sustainable development and climate resilience.

Future international climate action needs to be based on comprehending the strengths and flaws of the Paris Agreement because of accelerating climate threats against vulnerable ecosystems and communities. Research work reveals how joint efforts and creative thinking serve to address an immediate threat that humanity must face.

2. Literature review: the Paris agreement: goals and framework

2.1. Core Objectives and Commitments

2.1.1. Limited Global Temperature Rise to Well below 2°C (preferably 1.5°C)

The international climate policy reached its milestone when member nations adopted the Paris Agreement during the COP21 in 2015 (United Nations, 2015). The agreement seeks to achieve two fundamental objectives: a 2°C target for maximum temperature rise over pre-industrial times and a secondary aim of attaining a 1.5°C limit (BBC, 2021). Scientists have established a universal agreement that exceeding 1.5°C of global temperature will result in devastating and permanent changes, including severe weather events, rising ocean levels, and substantial biodiversity reduction (IPCC, 2018). Small island states, along with other vulnerable nations, lead the support for the 1.5°C target because they face increased climate threats (Iberdrola, 2022). The International Panel on Climate Change reinforced the importance of the 1.5°C target through their 2018 Special Report by demonstrating the distinct climate hazards surrounding 1.5°C and 2°C of warming (IPCC, 2018). The necessary temperature goals demand accelerated greenhouse gas reductions as a foundation for transitioning worldwide toward sustainable low-carbon economies (World Resources Institute, 2020).

2.1.2. Nationally Determined Contributions (NDCs)

The Paris Agreement focuses on Nationally Determined Contributions (NDCs) as individual climate action plans that each participating country presents (United Nations, 2015). The plans contain detailed commitments for emission reduction and adaptation strategy improvement, demonstrating nations' particular conditions and capabilities (World Resources Institute, 2020). Through the framework, countries can create targets that adapt according to their economic conditions and technological capabilities (BBC, 2021). NDCs need to reflect the maximum possible ambition of countries,

while countries should strive to increase their commitments in subsequent NDC submissions (Iberdrola, 2022). Many NDCs embrace adaptation plans next to their mitigation approaches to protect against local threats (World Resources Institute, 2020). Every five years, the Paris Agreement demands nations revise their NDCs, which sustains their ambition and progress (United Nations, 2015). The current NDCs show insufficient climate reduction efforts to meet the 1.5-degree Celsius target, requiring stronger national commitment (BBC, 2021).

2.1.3. Mechanisms for Transparency and Accountability

Through its strong transparency and accountability systems, the Paris Agreement promotes trust between nations and adherence to its provisions (Iberdrola, 2022). The framework is essential to monitor national advancement while promoting worldwide collaboration (World Resources Institute, 2020). Countries must report their emissions data and NDC progress through the Enhanced Transparency Framework, which receives expert reviews and peer assessments to ensure accurate reporting (United Nations, 2015). The reporting system requires nations to present their emissions data and climate change mitigation plans and their assistance and funding activities in two-year intervals (Iberdrola, 2022). The agreement contains a Global Stocktake as its main feature for periodic assessment of collective progress toward its established objectives (World Resources Institute, 2020). Through its compliance approach, the mechanism provides assistance and backing instead of punishment to respect national authority while maintaining accountability (BBC, 2021). The transparency framework connects standardized reporting with national context flexibility so all climate action stakeholders can contribute meaningfully (Iberdrola, 2022).

2.2. Key Principles and Mechanisms

2.2.1. The Role of Developed and Developing Countries

Through its "common but differentiated responsibilities and respective capabilities" (CBDR-RC) principle, the Paris Agreement establishes that every nation must fight climate change (UNFCCC, 2015). Yet, their specific commitments match their historic emissions together with their capabilities (Iberdrola, 2022). Countries with high historical greenhouse gas emission records are primarily responsible for cutting their pollution rates while giving financial backing and technological assistance to countries with developing economies (World Resources Institute, 2020). Countries should present stronger NDCs because of their elevated capabilities to act (BBC, 2021). The Paris Agreement encourages developing countries to establish ambitious targets while acknowledging their requirement to place their economic development and poverty reduction as top priorities (Iberdrola, 2022). The continued support from developed nations will enable underdeveloped nations to achieve sustainable growth (World Resources Institute, 2020). The separation of national abilities aims to create fair conditions that allow all countries to participate in worldwide climate change (UNFCCC, 2015).

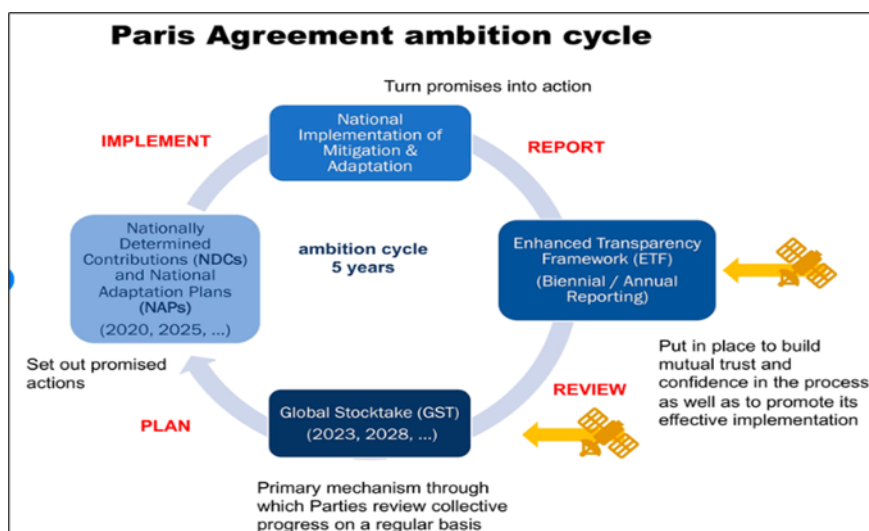


Figure 2 Paris Agreement Ambition Cycle

2.2.2. Financial and Technological Support Mechanisms

The Paris Agreement establishes mechanisms to gather financial and technological support for developing countries, promoting their effective climate action engagement (Iberdrola, 2022). The \$100 billion annual target dedicated by developed nations for developing nation climate support efforts will be managed through the Green Climate Fund and

bilateral agreements (World Resources Institute, 2020). Actual financial support systematically fails to meet these targets, forcing the international community to demand better transparency and dedication from funding institutions (BBC, 2021). Through the agreement, developing countries obtain access to clean technologies, which helps them deploy low-carbon solutions across their territories (Iberdrola, 2022). Through the Technology Mechanism under the UNFCCC, important steps are taken to facilitate this process (UNFCCC, 2015). The agreement supports programs that build local capacity to handle technical and institutional gaps experienced by many countries as part of their efforts to strengthen their expertise and governance systems (World Resources Institute, 2020). The established mechanisms bridge the gap between developed and developing nations by enabling all countries to participate in global climate initiatives (Iberdrola, 2022).

2.2.3. The Global Stocktake Process

The Paris Agreement contains the Global Stocktake (GST) as its core assessment mechanism, which will evaluate collective progress every five years beginning in 2023 (UNFCCC, 2015). The GST evaluates three core areas: mitigation measures, adaptation strategies, and implementation mechanisms with financial support and technological resources (World Resources Institute, 2020). The assessment depends on scientific information and stakeholder input to monitor worldwide developments and performance (Iberdrola, 2022). The GST operates without mandatory requirements because it only identifies deficiencies and potential openings in national climate practices—the system increases determination and collaboration between countries instead of establishing mandatory requirements (BBC, 2021). Global climate action will benefit from the GST because it detects achievements and failures to boost international responsibility and facilitate teamwork between nations (World Resources Institute, 2020).

The Paris Agreement introduces groundbreaking climate governance through its temperature objectives and Nationally Determined Contributions, allowing countries to create emission reduction strategies (UNFCCC, 2015). Through established transparency mechanisms, such as IT frameworks and support structures, the agreement works to unite nations in their efforts against diverse climate change challenges (Iberdrola, 2022). The agreement's success depends on the combined national determination with a faithful commitment to execution and resource mobilization to prevent any nation from being left behind when pursuing sustainable development (BBC, 2021)

3. Successes of the Paris agreement

Through its adoption in 2015, the Paris Agreement achieved major progress in managing climate change. The agreement's implementation has produced exceptional global alliances, renewable energy growth, increased funding, and enhanced public climate awareness (UNFCCC, 2015). The agreement produced critical advancements within its targeted areas, as this part demonstrates how it generated both progress and new developments.

3.1. Increased Global Participation and Commitment

3.1.1. Widespread International Adoption and Ratification

The Paris Agreement reached its success milestone through widespread acceptance at the global level. One hundred ninety-six countries accepted the Paris Agreement from all UNFCCC member states, and 194 formally ratified the treaty in 2023 (UNFCCC, 2023). This wide global support makes the treaty one of the most extensively endorsed international agreements ever (Hale, 2020). The Paris Agreement stands apart from previous agreements, including the Kyoto Protocol, because it demands commitments from every country beyond economic distinctions (Bodansky, 2016). The widespread involvement demonstrates how all nations understand climate change requires worldwide united efforts to address this global problem. The agreement operates as a diplomatic tool to establish international cooperation between countries, although they face political disputes (IPCC, 2021).

3.1.2. Enhanced Climate Policies at the National Level

Nations recognized the Paris Agreement as a catalyst for creating and deploying effective climate measures across their territories (UNEP, 2022). Many countries successfully merge their Nationally Determined Contributions (NDCs) with their domestic policy structures to unite climate and national development targets (UNFCCC, 2018). The push for decarbonization within different sectors resulted in major legislative and regulatory changes. Through the European Union, the European Green Deal declares its goal of achieving climate neutrality across Europe by 2050 (European Commission, 2019). India seeks to generate 50% of its total energy requirements from renewable sources by 2030 (Government of India, 2021). China has committed to reaching its peak carbon emission levels no later than 2030 (China State Council, 2020). Subnational entities such as regional and local governments have made major climate policy

contributions by implementing targets exceeding their national governments' set (Hsu et al., 2019). National strategies with tailored climate action ownership have become possible because of the agreement's effectiveness (UNFCCC, 2021).

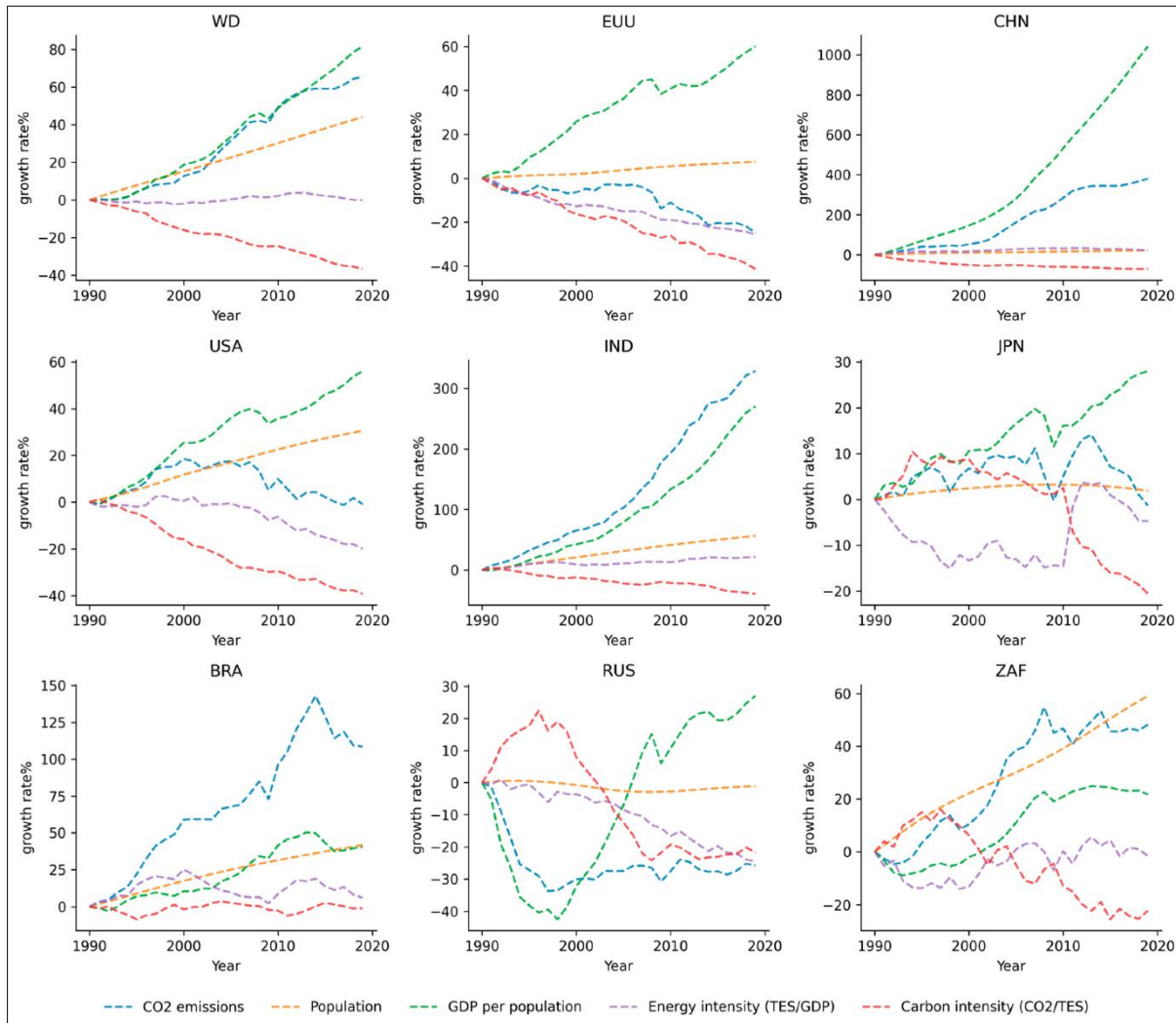


Figure 3 Decomposition of carbon emission drivers across countries

3.2. Progress in Renewable Energy and Emission Reductions

3.2.1. Growth in Renewable Energy Investments

The Paris Agreement has driven the world toward renewable energy at an unprecedented rate since its approval. Renewable energy capacity worldwide increased by over 100% from 2015 until 2023, when solar power systems and wind turbine installations surpassed all other sectors (International Energy Agency [IEA], 2023). The installation of solar photovoltaic power capacity maintains annual growth exceeding 20%, while wind energy projects have shown substantial development in European, Chinese, and American territories (REN21, 2023). The expenses related to renewable energy generation have decreased dramatically since 2010 because solar power prices have fallen by over 80%, making them equal to or less expensive than traditional fossil fuels in different regions (IRENA, 2022). Private companies now actively engage in renewable energy projects because they want to join forces with the Paris Agreement's established objectives (UNFCCC, 2021).

3.2.2. Declining Carbon Intensity in Key Sectors

The Paris Agreement has succeeded in breaking economic expansion from greenhouse gas emission growth within multiple industrial sectors (IPCC, 2021). The world has accomplished a decrease in electricity generation carbon emissions through its shift from coal power to renewable and natural gas energy systems (IEA, 2022). The transportation sector has experienced major changes as electric vehicle (EV) adoption reached all-time high sales

worldwide (BloombergNEF, 2023). The EU has introduced a policy to ban new gasoline and diesel fuel vehicles starting from 2035 (European Commission, 2022). The steel and cement industries are investigating hydrogen-based production methods while exploring carbon capture and storage (CCS) as low-carbon technologies (Global CCS Institute, 2023). The progress demonstrated by these trends does not address the difficulty of reaching deep emission reductions required to meet Paris Agreement temperature goals (UNEP, 2023).

3.3. Strengthening Climate Finance and Innovation

3.3.1. Green Climate Fund and Financial Commitments

According to the Paris Agreement, financial assistance plays a crucial role in enabling worldwide climate action throughout developing nations (UNFCCC, 2015). The creation of the Green Climate Fund (GCF) represents a major accomplishment because it is the main source for financing climate adaptation and mitigation projects in underdeveloped nations (Green Climate Fund, 2023). The GCF approved more than \$12 billion through its programs to fund renewable energy systems and agricultural projects that build climate resilience during the period from 2023 (GCF, 2023). Climate finance participation by the private sector increased significantly due to the agreement, resulting in green bonds and sustainable investments (OECD, 2022). Developed countries have not fully achieved international commitments to raise \$100 billion yearly since 2020 (Climate Policy Initiative, 2023). The world witness continuous advancement because talks have started to boost financial support after 2025 (UNFCCC, 2023).

3.3.2. Technological Advancements in Clean Energy and Carbon Capture

Through the Paris Agreement, technology innovations for clean energy and carbon reduction have emerged (IPCC, 2021). Renewable energy systems achieved major advancements through solar photovoltaics and wind turbines, resulting in improved availability and operational stability of these power sources (IEA, 2023). The implementation of carbon capture utilization storage (CCUS) technologies has progressed through pilot projects in Norway and Canada, displaying their ability to reduce emissions in difficult decarbonizing industries (Global CCS Institute, 2023). Green hydrogen production from renewable energy shows great potential to decarbonize steel manufacturing, chemical production, and heavy transportation industries (IRENA, 2023). The agreement demonstrates its power to eliminate obstacles against successful climate action through new technological developments (UNEP, 2022).

3.4. Public Awareness and Non-State Actor Contributions

3.4.1. Role of Businesses and Civil Society in Climate Action

Through the Paris Agreement, non-state actors, including businesses, civil society organizations, and academic institutions, actively participate in fighting climate change (United Nations, 2015). Multinational businesses across the globe are moving toward setting climate targets that match the Paris Agreement's purpose (Rogelj et al., 2016). For instance, Microsoft, Apple, and Amazon join other companies that intend to reach net-zero emissions across specific periods (Science-Based Targets initiative [SBTi], 2023). Thousands of companies now join the Science-Based Targets initiative (SBTi) through their commitment to lower emissions according to the 1.5°C target (SBTi, 2023). Civil society entities have proven essential in climate change awareness campaigns that push governments and businesses to meet their climate commitments (Harvey et al., 2020).

3.4.2. Local Government and City-Level Climate Initiatives

Local governments and cities have stepped forward as leading implementers of climate solutions because they produce more than 70 percent of global CO₂ emissions (Intergovernmental Panel on Climate Change [IPCC], 2022). Through their membership in C40 Cities and the Global Covenant of Mayors, cities worldwide have formed a united front to advance serious climate initiatives (C40 Cities Climate Leadership Group, 2021). Urban areas implement sustainable energy conservation measures, green infrastructure development, and advanced public transportation frameworks (World Resources Institute [WRI], 2021). For example, Copenhagen aims for carbon neutrality by 2025, and Paris has established programs to minimize cars on the road and boost biking (C40 Cities Climate Leadership Group, 2021). Local governments dedicate financial resources to building climate-resilient systems that protect populations from severe weather events, demonstrating essential localized action that strengthens global climate strategies (United Nations, 2015).

The Paris Agreement demonstrates its effectiveness by increasing worldwide participation and enhancing renewable energy penetration, climate financing mechanisms, and non-governmental actor involvement (Rogelj et al., 2016). The agreement successfully unites all participants through shared objectives, accelerating progress across different sectors.

Sustained efforts and enhanced ambition will be vital to close the present action deficit, which is in the way of achieving the 1.5°C target (IPCC, 2022).

4. Challenges and limitations

4.1. Insufficient and Unambitious Commitments

One main obstacle to the Paris Agreement is that Nationally Determined Contributions (NDCs) exhibit insufficient strength and lack of ambition (United Nations, 2015). The intended purpose of NDCs was to demonstrate countries' maximum possible aspirations, but their targets failed to meet the temperature reduction requirements (Rogelj et al., 2016). Scientific evaluations show that the complete execution of present NDCs would result in global temperature increases reaching 2.4 to 2.6°C throughout the year 2100 (Climate Action Tracker, 2021). The major emitting countries, including China, the United States, and India, demonstrate insufficient commitment through this notable gap in their climate change efforts (IPCC, 2022). The targets established by these countries span multiple decades into 2050 and later periods, thus delaying critical immediate steps needed for action (Harvey et al., 2020).

The Paris Agreement functions through voluntary commitments instead of using legally enforceable obligations (United Nations, 2015). The voluntary nature of commitments proves difficult to force countries to meet their promised targets. The Paris Agreement allows but does not require each nation to revise their NDCs at five-year intervals without any enforcement mechanisms to ensure compliance (Rogelj et al., 2016). Without consequences, countries can establish minimal targets and delay their update requirements. Domestic political barriers become additional challenges because powerful emission industries lobby while economic growth precedes environmental initiatives (Harvey et al., 2020). The agreement fails to achieve transformative change because it does not have enforceable obligations.

4.2. Weak Compliance and Accountability Mechanisms

Weak accountability systems within the Paris Agreement restrict the agreement's success in reaching its climate goals. The Paris Agreement differs from the Kyoto Protocol because it avoids using binding targets for developed nations and functions through non-binding commitments (United Nations, 2015). The agreement lacks enforcement power because it grants countries the freedom to achieve or exceed their NDCs without penalty. Consequently, the deal struggles to maintain party accountability (Rogelj et al., 2016). The agreement emphasizes transparency using the Enhanced Transparency Framework (ETF) for reporting purposes and peer reviews (United Nations, 2015). The cooperative framework of this approach creates good relations but does not provide the necessary enforcement mechanism to verify commitment fulfillment.

Accurate monitoring and verification of emissions reduction efforts constitute a major difficulty for Parties to the Paris Agreement (IPCC, 2022). The developing world faces problems with technical measurement systems and the necessary infrastructure to document their emissions properly (World Resources Institute [WRI], 2021). The lack of consistent data quality creates problems for global accountability because of these inconsistencies. Monitoring emissions from diffuse sources, including agriculture and land use, requires advanced methods because these sectors rely mainly on estimated instead of direct measurement data (Harvey et al., 2020). Integrating non-state actor data from businesses and cities into official national reporting remains inconsistent, which hinders overall climate goal assessment (WRI, 2021).

4.3. Financial and Technological Barriers

The Paris Agreement faces major obstacles to its implementation because developing nations experience significant differences in finance and technology (Rogelj et al., 2016). The financial difficulties these nations experience stop them from pursuing intense climate change solutions. Developed nations failed to fulfill their commitment to provide \$100 billion annually from 2020 onward for climate change initiatives in developing nations, although actual money contributions did not meet the promised amount (United Nations Framework Convention on Climate Change [UNFCCC], 2021). Critical adaptation needs of vulnerable nations do not get sufficient funding since climate finance distributions prioritize mitigation initiatives such as renewable energy deployment (IPCC, 2022). High debt levels prevent numerous developing countries from implementing climate resilience projects and sustainable development initiatives (World Bank, 2020).

Steady access to environmentally friendly technology represents an important space where different social groups face unequal opportunities (Harvey et al., 2020). The high cost of advanced clean energy technologies prevents developing nations from implementing them, but they fall behind in adopting such technologies (UNFCCC, 2021). The transfer of essential technologies to low-income nations becomes complicated because of intellectual property issues, including

patent ownership restrictions (IPCC, 2022). Numerous developing nations experience implementation challenges that block their ability to run and maintain their green technologies properly. The existing financial and technological obstacles create additional global disparities that prevent equal climate change participation from all nations (World Bank, 2020).

4.4. Political and Economic Resistance

The Paris Agreement's success rate depends heavily on political and economic conditions (IPCC, 2022). The U.S. withdrew from the Agreement when President Trump took office in 2017 because American domestic politics changed substantially (Harvey et al., 2020). When President Biden brought the U.S. back into the Paris Agreement in 2021, the former departure under President Trump had already diminished worldwide climate change momentum (Rogelj et al., 2016). Climate policy remains a highly contested topic because different political factions, businesses, and interest groups oppose extensive climate action, creating substantial delays in progress (Harvey et al., 2020).

The fossil fuel industries display considerable power, which creates major obstacles (IPCC, 2022). The continuing heavy dependence on fossil fuels within numerous economies makes the shift to renewable energy systems harder to achieve. Climate initiatives face substantial challenges when fossil fuel companies use their lobbying power to block the elimination of fossil fuels (WRI, 2021). Economic interests dominate national priorities in developing countries because their governments focus on economic development and poverty reduction instead of climate protection initiatives (World Bank, 2020). Such an understanding leads to resistance against emissions cuts by focusing on development constraints while requiring enhanced cooperation between nations to overcome this opposition (Rogelj et al., 2016).

4.5. Climate Justice and Equity Issues

The Paris Agreement must uphold "common but differentiated responsibilities and respective capabilities" (CBDR-RC) among nations but faces ongoing disputes about developed and developing nations' differences (United Nations, 2015). Developed nations have created most of the present-day greenhouse gas emissions, yet developing nations experience the highest climate risks despite emitting minimal emissions (IPCC, 2022). Developing countries depend on international help for climate action because they lack financial backing and proper technical capabilities (UNFCCC, 2021). The imbalance in climate finance distribution intensifies regional disparities because it disproportionately affects defenseless populations across African territories alongside Asian and Pacific areas (Harvey et al., 2020).

The Small Island Developing States, the Least Developed Countries, and other vulnerable countries confront major climate change risks because they experience severe weather events and increasing ocean levels (IPCC, 2022). The Paris Agreement recognizes the urgent need to handle loss and damage from climate effects, yet funding systems for these specific purposes face substantial obstacles to their development (UNFCCC, 2021). At the international level, vulnerable states demand legal instruments to handle permanent climate damage to protect their fundamental rights to equity and justice across climate governance (United Nations, 2015). The situation shows we need an approach that deals with the requirements of groups most impacted by climate change and promotes equality and inclusion (Harvey et al., 2020).

The Paris Agreement establishes a vital milestone in global climate governance, but various key obstacles hinder its operational effectiveness. Multiple barriers, including inadequate commitments and poor compliance systems, as well as financial hurdles and technological constraints alongside political and economic opposition and equity issues, hinder the achievement of its targets (IPCC, 2022). Effective climate change combat requires countries to unite their efforts while raising their climate goals and guaranteeing equal participation for all nations. The progress toward sustainable development requires prompt resolution of these obstacles to achieve necessary transformative changes against the climate crisis (Rogelj et al., 2016).

Table 1 Key Successes and Challenges of the Paris Agreement

Category	Successes	Challenges
Global Participation	<ul style="list-style-type: none"> - Over 190 countries have ratified the agreement. - Encourages voluntary commitments from both developed and developing nations. 	<ul style="list-style-type: none"> - Some countries have withdrawn or threatened to withdraw (e.g., U.S. under Trump administration) - Lack of legally binding enforcement for participation.

Emission Reductions	<ul style="list-style-type: none"> - Several nations have implemented policies to reduce greenhouse gas (GHG) emissions. - Expansion of renewable energy sources worldwide. 	<ul style="list-style-type: none"> - Current Nationally Determined Contributions (NDCs) are insufficient to meet the 1.5°C goal. - Increased emissions from some major economies.
Climate Finance	<ul style="list-style-type: none"> - Green Climate Fund and other financial mechanisms established to support developing nations. - Increased investment in green technologies. 	<ul style="list-style-type: none"> - Developed countries have not fully met their \$100 billion annual climate finance commitment - Insufficient financial support for adaptation in vulnerable nations.
Transparency & Monitoring	<ul style="list-style-type: none"> - The Enhanced Transparency Framework (ETF) was introduced to track progress - Regular Global Stocktake every five years to assess collective efforts. 	<ul style="list-style-type: none"> - Some countries lack capacity to accurately report emissions data. - No strong enforcement mechanisms for non-compliance with reporting requirements.
Technological Innovation	<ul style="list-style-type: none"> - Growth in clean energy technologies like solar and wind power - Advancements in carbon capture and storage (CCS). 	<ul style="list-style-type: none"> - High costs of green technology adoption in developing nations - Slow transition away from fossil fuel dependency in some regions.
Political & Economic Resistance	<ul style="list-style-type: none"> - Increased corporate and non-state actor involvement in climate action - Shift toward green economies in some countries. 	<ul style="list-style-type: none"> - Influence of fossil fuel industries obstructing climate policies - Political shifts leading to policy reversals in some nations.

5. Future directions and policy recommendations

The Paris Agreement creates an essential structure for worldwide climate efforts but needs better existing tactics to reach its demanding targets (United Nations, 2015). Plans require prioritizing Agreement improvements through ambition enhancement, greater accountability systems, resource mobilization, and full stakeholder engagement (Rogelj et al., 2016). The following recommendations detail methods to enhance Agreement performance while developing a just and sustainable path toward low-carbon operation.

5.1. Strengthening NDC Ambition and Implementation

Enhancing the Paris Agreement's effectiveness depends heavily on strengthening NDC ambition and execution through Nationally Determined Contributions (IPCC, 2022). Many NDCs fail to achieve the required ambition to fulfill the Paris Agreement objectives (Climate Action Tracker, 2021). Multiple strategies exist to motivate countries toward setting more ambitious targets. International climate meetings allow nations to put diplomatic pressure on countries through their interaction with each other to increase their environmental commitments (Harvey et al., 2020). When leading countries expose their aggressive targets publicly, it creates a model for other nations to adopt. Developed nations should establish climate change-related financial and technological incentive programs to improve the climate action performance of developing countries through climate finance and trade agreements (UNFCCC, 2021).

Scientific organizations like the IPCC generate comprehensive guidelines to connect NDCs with the 1.5°C target, which helps countries establish practical goals (IPCC, 2022). To achieve successful implementation, countries need strong governance systems that operate at the national level. National governments should establish NDCs as legal documents, protecting them from political changes (United Nations, 2015). Ministries from different sectors should join forces to embed climate targets throughout national policies that affect energy production, transportation, and agriculture sectors (Harvey et al., 2020). Developing countries will receive help to build better institutions and enhance their data collection capabilities so ambitious targets produce quantifiable results (World Bank, 2020).

5.2. Enhancing Compliance and Accountability Mechanisms

The Paris Agreement faces performance limitations because its accountability systems and enforcement processes remain weak (Rogelj et al., 2016). The voluntary nature of the agreement necessitates the development of stronger monitoring and enforcement frameworks. The Enhanced Transparency Framework (ETF) needs improvement to demand detailed reports about emissions and NDC achievements together with climate finance contributions (UNFCCC,

2021). Independent auditing by third parties would enhance the credibility of the reporting while increasing its accountability (IPCC, 2022). Every five years, the Global Stocktake (GST) must deliver practical advice for nations not meeting their obligations while publicly revealing evaluation results to enhance political and social pressures for improvement (Harvey et al., 2020).

Legal structures should act as enforcement tools for compliance standards alongside mechanisms for handling complaints (Rogelj et al., 2016). Climate litigation provides a means to charge nations that do not carry out their emission targets or generate cross-border pollution damage through emissions (UNFCCC, 2021). When climate change affects human rights in specific ways, legal systems now have the potential to protect vulnerable communities through their existing structures. A specialized climate arbitration system would help settle conflicts about climate finance and technology transfer, enhancing the compliance structure (IPCC, 2022).

5.3. Expanding Climate Finance and Technology Transfer

The successful mobilization of climate funds helps developing nations achieve their climate targets (UNFCCC, 2021). Developed countries must fulfill their existing \$100 billion annual contribution while agreeing to progressively increase it after 2025 because climate adaptation and mitigation expenses keep rising (World Bank, 2020). Developing nations should receive grant funds and concessional loans instead of debt-based financing because such debt increases their economic strain (Harvey et al., 2020). Governments can promote climate project investment from the private sector through collaborative risk-sharing programs that unite public and private sector entities (World Resources Institute [WRI], 2021).

Developing nations require equal support during their shift to green economies. The Climate Technology Centre and Network (CTCN) requires expansion to provide access to clean energy technology for African and South Asian countries (UNFCCC, 2021). Initiatives that build renewable energy expertise through local training programs with academic institutions develop the capacity to implement sustainable practices (IPCC, 2022). Financial and technical support systems must back just transition programs to achieve a socially inclusive transition from fossil fuels by providing new sources of employment for those affected by the change (Harvey et al., 2020).

5.4. Strengthening Multilateral and Regional Cooperation

The global community must establish international organizations supporting and coordinating climate action efforts (United Nations, 2015). The United Nations Framework Convention on Climate Change (UNFCCC) must maintain responsibility for climate negotiations, technical guidance, and performance tracking of the Paris Agreement objectives through its existing framework (UNFCCC, 2021). The Intergovernmental Panel on Climate Change (IPCC) performs scientific assessments for policymaking so actions maintain their consistency with current climate science (IPCC, 2022). Institutions, including the World Bank and other multilateral development banks, must establish renewable energy initiatives and climate-resilient development projects as primary funding priorities (World Bank, 2020).

International climate agreements serve as supplementary frameworks that concentrate on specific regional issues that differ between regions (Harvey et al., 2020). The European Green Deal demonstrates successful climate policies that other areas can use as examples of effective practices (WRI, 2021). Regional cooperation efforts across Africa should focus on designing renewable energy projects while adapting to climate change. The Asia-Pacific region will advance clean energy technology innovation while attracting investments through nation-to-nation collaboration for enhanced climate change battle (UNFCCC, 2021).

5.5. Engaging Non-State Actors and Civil Society

Continued involvement between non-state actors like businesses, local communities, and civil society organizations plays an essential role in reaching Paris Agreement goals (United Nations, 2015). Corporate accountability needs encouragement because businesses should establish science-based targets while maintaining complete transparency with their emissions reduction progress (Harvey et al., 2020). Local authorities must impose disclosure regulations on corporate entities to provide clear information about their climate-related hazards, greenhouse gas output, and sustainability plans (WRI, 2021). The combination of public and private sector partnerships speeds up clean technology development that leads to sustainable practice adoption (IPCC, 2022).

Civil society organizations and grassroots movements serve as essential drivers that implement climate action at grassroots levels (Harvey et al., 2020). Local communities lead successful initiatives through reforestation projects combined with sustainable agriculture, which produces practical outcomes and boosts community empowerment. The climate policy pressure on governments has increased because grassroots movements such as Fridays for Future

successfully made public awareness grow (IPCC, 2022). Wider climate education initiatives will drive sustainability culture development to boost participation in general climate solutions while allowing various voices to contribute to global climate targets (UNFCCC, 2021).

The success of the Paris Agreement depends on how well the worldwide population handles current problems and system weaknesses (United Nations, 2015). The Paris Agreement will strengthen its effectiveness as a climate change combatting framework through better ambition from NDCs, improved compliance systems, financial and technological access, and international cooperation with non-state actors. These policy guidelines present a course of action that shows the way to necessary transformative changes for securing sustainable and resilient futures for everyone while drawing attention to our collective duty to fight the climate crisis directly (Rogelj et al., 2016).

6. Conclusion

6.1. Summary of Findings

Through the Paris Agreement, international climate diplomacy evolved to a new standard, which became a groundbreaking accomplishment at the global level for climate change governance (United Nations, 2015). The agreement demonstrates how nations coming together as one can tackle the crucial issue of our present era (Rogelj et al., 2016). The agreement achieved two important milestones through broad membership and renewable energy progress, yet it also exposed the intricate difficulties of managing international climate policy (IPCC, 2022).

Most countries worldwide participated in the climate agreement due to their joint commitment to address climate change (United Nations, 2015). Countries' dedication has resulted in new national programs that work to decrease carbon pollution and expand renewable power investments (Harvey et al., 2020). The Green Climate Fund and other initiatives have increased financial backing for developing countries to help them build low-carbon economies (UNFCCC, 2021). Non-state actors such as businesses and local governments have joined forces to support climate action despite the emerging political challenges (WRI, 2021).

The agreement encounters multiple important hurdles as it moves forward. Most countries have submitted NDCs that fail to achieve the temperature targets as present climate change projections indicate levels exceeding international objectives (Climate Action Tracker, 2021). The lack of binding enforcement systems creates difficulties for accountability since climate justice remains a concern, especially with respect to support for vulnerable nations (Harvey et al., 2020). The achievement of climate progress faces obstacles from political and economic pressures that stem from alterations in national policies along with fossil fuel lobbying activities (IPCC, 2022).

6.2. Implications for Global Climate Policy

Global climate change mitigation requires continuous international cooperation according to the Paris Agreement (United Nations, 2015). The present rate of progress fails to fulfill the targets established by the agreement. Countries must strengthen NDC ambition levels by adopting powerful national and international cooperative policies that execute NDCs effectively (Rogelj et al., 2016). The essential elements for tackling climate inaction include resolving political opposition and economic dependence on fossil fuels (Harvey et al., 2020).

Upcoming climate talks should construct their framework on the Paris Agreement but need to resolve its weaknesses. The system requires better monitoring of commitment implementation and needs stronger mechanisms to support developing nations' adaptation needs and effective loss and damage provisions for vulnerable countries (UNFCCC, 2021). The UNFCCC, IPCC, and other multilateral organizations will be key in supporting these initiatives (IPCC, 2022).

6.3. Final Thoughts on the Future of Global Climate Action

The success of the Paris Agreement and future climate initiatives hinges on sustained political commitment and public engagement (Harvey et al., 2020). Government institutions should establish climate action as a primary policy objective by connecting it to national economic prosperity and social welfare achievements (United Nations, 2015). Citizens must actively advocate for creating stronger climate policies and practicing sustainable activities (Rogelj et al., 2016).

The rising emergency of the climate crisis demands quick, decisive action. A failure to act in the 2020s will produce devastating results, including severe weather conditions and ecosystem damage (IPCC, 2022). The world requires immediate, strong actions, including shifting toward renewable energy alongside ecosystem restoration work and aiding vulnerable communities to establish resilience capabilities (UNFCCC, 2021).

Although the Paris Agreement has established significant progress in global climate solutions, it requires sustained innovative approaches to confront its present obstacles. Future success depends on community-wide active engagement with climate challenges to secure sustainability and fairness across generations (Harvey et al., 2020).

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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